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U.S. Patent

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Application of: M. NAKAMURA ET AL

DEC 16 2003

Serial Number : 09/998,764

TC 1700

Filed : November 29, 2001

For : PIGMENT DISPERSION LIQUID, MANUFACTURING
PROCESS THEREOF, PIGMENT INK FOR INK JETTING,
AND INK JET IMAGE RECORDING METHOD EMPLOYING
THE SAME

Group Art Unit: 1755

Examiner : SHALIE A. MANLOVE

DECLARATION UNDER 37 C.F.R. 1.132

Hon. Commissioner of Patents
and Trademarks
Washington, D.C. 20231

Sir:

I, MASAKI NAKAMURA, hereby declare and say as follows:

That I am a post graduate from Chiba University having been awarded a Masters Degree in Organic Synthetic Chemistry in March 1982.

That since April 1982, I have been employed by Konica Corporation, the owner of the above-identified application. During my employment, I have been engaged in the research and the study of photographic materials and ink jet recording materials in the Research and Development Laboratory of my company.

That I am a co-inventor of the present application.

That I am familiar with the subject matter of the present invention.

What follows is an accurate summary of experiments conducted according to my detailed instructions and under my personal supervision, and the results obtained therefrom.

Comparative tests

1. Claims 1-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bugner et al (US 5985017) in view of Sano et al (USPN 5324349).

However, neither Bugner et al. nor Sano et al. disclose the claimed invention. Neither Bugner et al. nor Sano et al. disclose a dispersion comprising a pigment derivative having a polar group as claimed. Therefore, instant claims are not obvious over the cited references.

In spite of the above, in order to show unexpected results of the invention, additional comparative tests were carried out employing Bugner et al. examples.

2. Preparation of Pigment dispersion liquids

Preparation of Pigment dispersion liquid 301 (Comparative)

Pigment dispersion liquid 301 was prepared in the same manner as in Example 5 of Bugner et al., except that pigment yellow 74 (described as especially preferred in col. 4, line 46 of Bugner et al.) was used. Pigment dispersion liquid 301 contained 20.00% of pigment yellow 74, 2.50% of KOMT, and 77.50% of high purity water.

Preparation of Pigment dispersion liquid 302 (Comparative)

Pigment dispersion liquid 302 was prepared in the same manner as in Example 6 of Bugner et al., except that pigment yellow 74 was used. Pigment dispersion liquid 302 contained 20.00% of pigment yellow 74, 2.50% of KOMT, and 77.50% of high purity water.

Preparation of Pigment dispersion liquid 303 (Comparative)

Pigment dispersion liquid 303 was prepared in the same manner as in Pigment dispersion liquid 302 above, except that the dispersion liquid was milled to have a D_{90} - D_{10} value as shown in Table 103. Pigment dispersion liquid 303 contained 20.00% of pigment yellow 74, 2.50% of KOMT, and 77.50% of high purity water.

Preparation of Pigment dispersion liquid 304 (Comparative)

Pigment dispersion liquid 304 was prepared in the same manner as in Pigment dispersion liquid 301, except that 15.00% of pigment yellow 74 and 5.00% of pigment derivative A were used. Pigment dispersion liquid 304 contained 15.00% of pigment yellow 74, 5.00% of pigment derivative A, 2.50% of KOMT, and 77.50% of high purity water. Herein, pigment derivative A is a compound in which a sodiumsulfo group as a polar group is introduced to pigment yellow 74.

Preparation of Pigment dispersion liquid 305 (Inventive)

Pigment dispersion liquid 305 was prepared in the same manner as in Pigment dispersion liquid 302, except that 15.00% of pigment yellow 74 and 5.00% of pigment derivative A were used. Pigment dispersion liquid 305 contained 15.00% of pigment yellow 74, 5.00% of pigment derivative A, 2.50% of KOMT, and 77.50% of high purity water.

Preparation of Pigment dispersion liquid 306 (Inventive)

Pigment dispersion liquid 306 was prepared in the same manner as in Pigment dispersion liquid 303, except that 15.00% of pigment yellow 74 and 5.00% of pigment derivative A were used. Pigment dispersion liquid 306 contained 15.00% of pigment yellow 74, 5.00% of pigment derivative A, 2.50% of KOMT, and 77.50% of high purity water.

D₁₀, D₉₀, and D₉₅ of the pigment dispersion liquids obtained above were measured in the same manner as in Example 1-1 of the present Specification. The results are shown in Table 103.

Table 103

Pigment dispersion liquid No.	Pigment used	D ₁₀	D ₉₀	D ₉₅	D ₉₀ -D ₁₀	Pigment derivative used	Re- marks
301	Pigment Yellow 74	10	38	41	28	None	Comp.
302	Pigment Yellow 74	9	30	34	21	None	Comp.
303	Pigment Yellow 74	8	24	-	16	None	Comp.
304	Pigment Yellow 74	10	37	-	27	A	Comp.
305	Pigment Yellow 74	9	30	-	21	A	Inv.
306	Pigment Yellow 74	8	24	-	16	A	Inv.

Inv.: Inventive, Comp. Comparative

3. Preparation of Pigment inks

Each of the pigment dispersion liquids 301 through 306 obtained above were diluted with water three times before pigment inks were prepared, and then pigment inks 301 through 306 were prepared from the diluted pigment dispersion liquids 301 through 306, respectively, in the same manner as in Example 1-2 of the present Specification.

4. Evaluation of Pigment inks

The resulting pigment inks obtained above were evaluated for ink recording head nozzle clogging, bronzing and glossiness in the same manner as in Example 1-2 of the present Specification. The results are shown in Table 104.

Table 104

Pigment ink No.	Pigment dispersion liquid No. used in pigment inks	Nozzle clogging	Plain paper sheet		Porous paper sheet		Remarks
			Bronzing	Glossiness	Bronzing	Glossiness	
301	301	C	C	C	C	B	Comp.
302	302	B	C	B	C	B	Comp.
303	303	B	C	B	C	B	Comp.
304	304	B	C	C	C	B	Comp.
305	305	A	B	A	B	A	Inv.
306	306	A	B	A	B	A	Inv.

Inv.: Inventive, Comp. Comparative

As is apparent from Tables 103 and 104 above, inventive pigment inks, comprising the inventive pigment dispersion liquids comprising pigment particles falling within the claimed scope and the pigment derivative, provide good resistance to nozzle clogging during ink jetting, and images with minimized bronzing and good glossiness, as compared with comparative pigment inks No. 302 and 303, comprising comparative pigment dispersion liquids comprising pigment particles falling within the claimed scope but no pigment derivative, or comparative pigment ink No. 304, comprising comparative pigment dispersion liquid comprising pigment particles falling outside the claimed scope and the pigment derivative. These results are unexpected to one of ordinary skill in the art. In view of the above, it would not have been obvious to one of ordinary skill in the art to attain the invention over Bugner et al. in view of Sano et al. Accordingly, we believe that instant claim 1, and all the claims, which depend therefrom, are in a situation of allowability.

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001, of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Dated: November 21, 2003

Masaki Nakamura

MASAKI NAKAMURA